

THE STORY OF  
THE BALTIMORE  
WATER SUPPLY

CITY OF BALTIMORE  
BUREAU OF CONSUMER SERVICES  
HON. THOMAS J. D'ALESSANDRO, III, MAYOR  
DR. F. PIERCE LINAWEAVER, DIRECTOR  
DEPARTMENT OF PUBLIC WORKS

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ORIGINAL  
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# THE STORY OF BALTIMORE'S WATER SUPPLY

An adequate supply of pure, wholesome water has always been a most important factor in the life of mankind. Primitive man obtained water for his needs by dipping crude vessels into streams, lakes and pot-holes. Later, wells were dug and the water was distributed in goatskins, gourds and earthen containers.

Methods of collecting and distributing progressed with the development of machinery to pump the water and pipes to distribute it. The present efficient systems are the result of many improvements over the years.

## HOW IT BEGAN

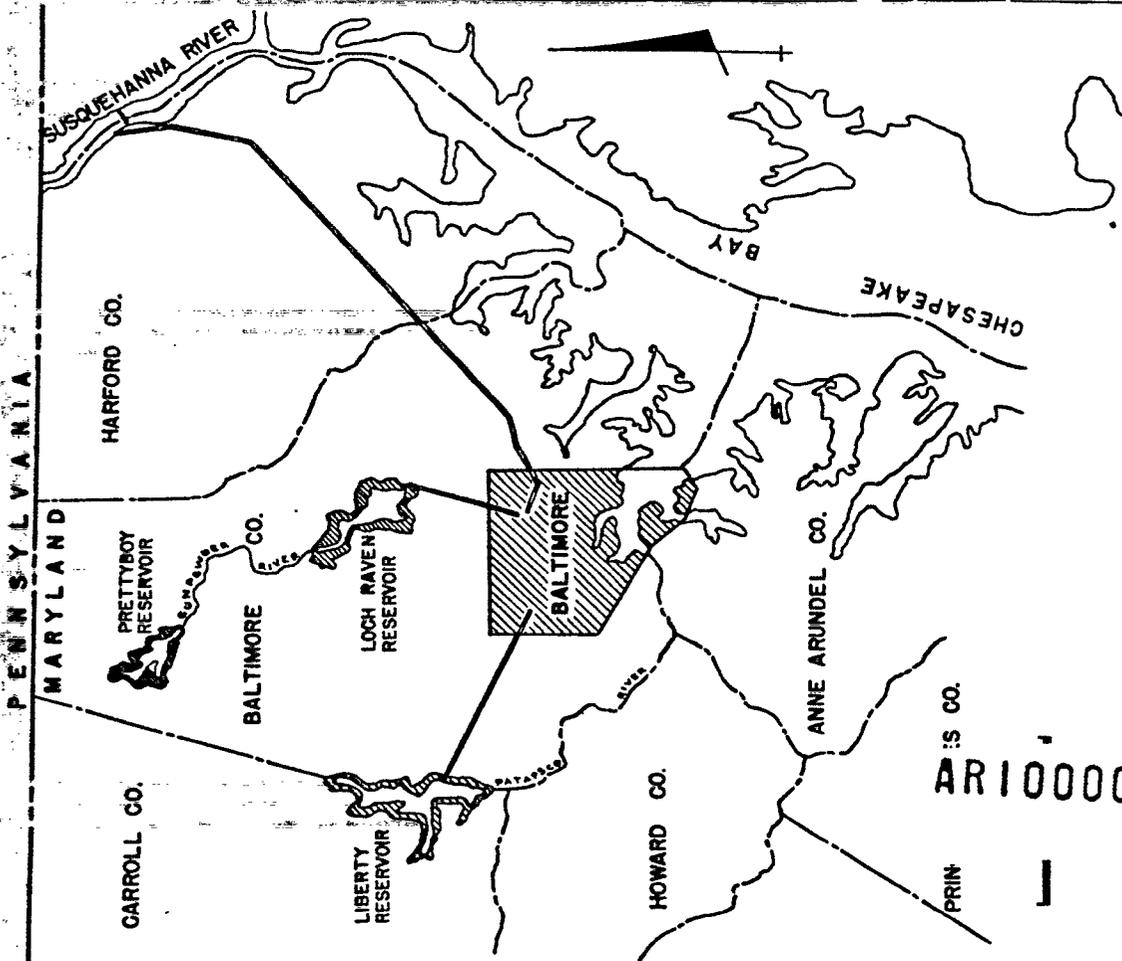
Baltimore City was created by an act of the Maryland General Assembly in the year 1797. Prior to that time the community was governed by special commissioners who in 1787 were entrusted with the enforcement of a law setting forth means for extinguishing fires.

The law required each householder to provide two leather buckets for the sole purpose of fire fighting and authorized the commissioners to sink wells and erect pumps at the request and expense of property owners to provide water for fire fighting.

One of the laws of the first City Council transferred the supervision of this means of fire control to the newly created City Commissioners and provided the sum of \$1,000 for maintenance and repair of the wells and pumps. Eventually these wells became an important source of domestic water for the inhabitants. An annual appropriation for their maintenance was continued until the last of the wells was filled in about 1915.

The city's first effort toward the development of a community water system resulted from a report of a City Council committee submitted in January of 1799. This committee recommended the laying of pipes by the City for the distribution of water from Carroll Run.

Work was stopped in June 1799 by property owners who disapproved the laying of pipes across or near their properties. The city petitioned the General Assembly of Maryland for authority to introduce water into the community and in December 1800, this power was granted.



Map indicates how raw water is gathered in outlying areas and fed to three filtration plants in Baltimore City.

## PRIVATE COMPANY FORMED

Subsequent efforts by the Mayor and City Council to construct a water system for the use of the city's inhabitants met with failures and at the February 1804 session of the council a resolution was passed authorizing the Mayor "to give public notice that proposals will be received at his office, until the first day of June next for introducing a copious and permanent supply of water into the City of Baltimore or any part thereof by any individual or company."

In consequence of such public notice that the city government was unable to cope with the situation, a meeting of citizens was called on April 20, 1804. As a result of this meeting a stock company was formed for the purpose of supplying the residents with water. This company, named the Baltimore Water Company, constructed a water-works on Jones Falls and installed a distribution system of wooden pipes. In May 1807, water started to flow through this system.

By 1810, the wells and pumps originally constructed for fire purposes undoubtedly were used as sources of domestic water by a large segment of the population. In this year the city government proceeded to develop other public sources of water through the purchase and preservation of certain springs. In all, four springs of good flow were chosen.

The names and locations of these springs or fountains were as follows: The Northern Fountain near Calvert and Saratoga Streets (1810); Western Fountain at Charles and Camden Streets (1810); Fountain at Eden and Pratt Streets (1819); the Center Market Place south of Baltimore Street (1821). Water for the Baltimore Water Company was supplied for many years by the Baltimore Company from a spring located at St. Paul Street north of the city. The spring houses and fountains had great architectural interest and were considered among the sights to be seen during a visit to Baltimore.

## CITY BUYS COMPANY

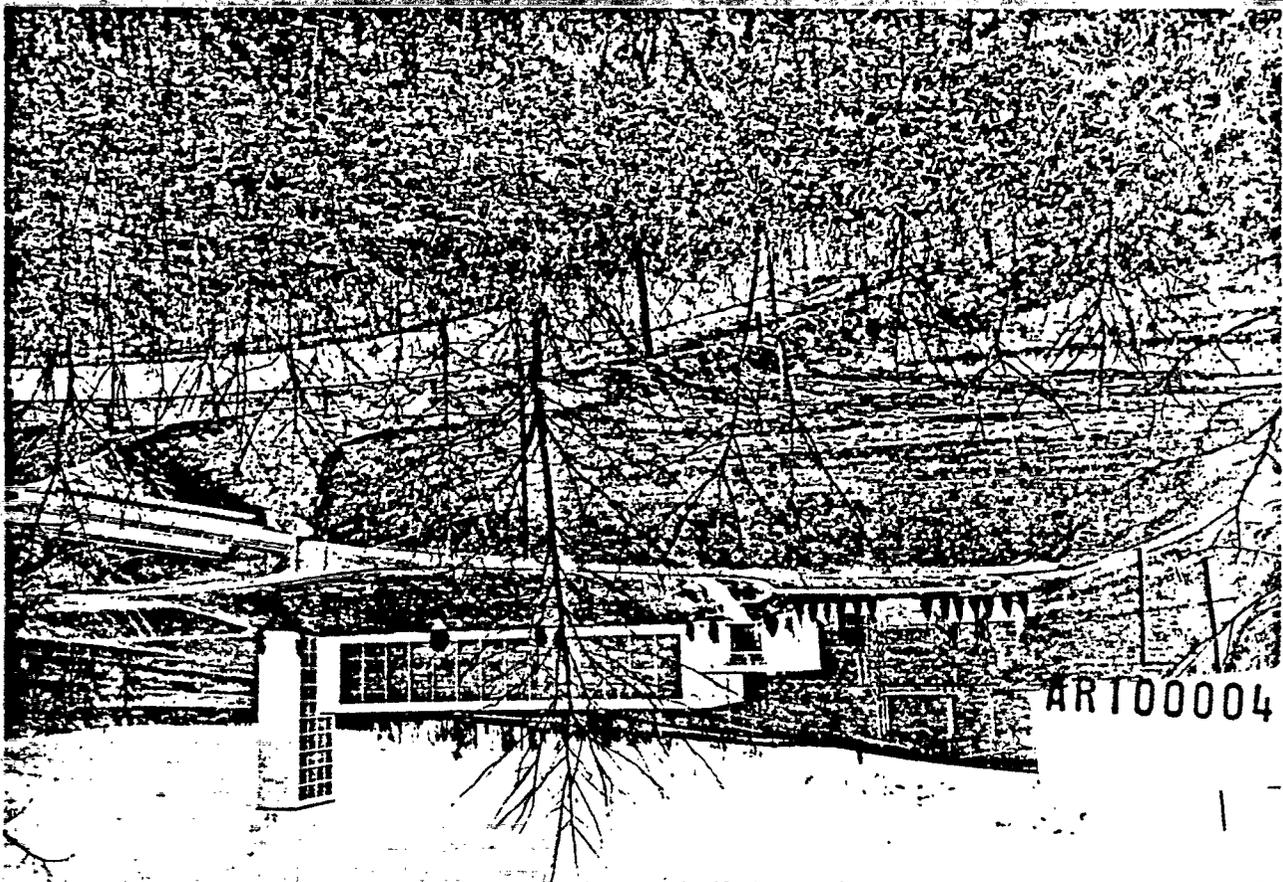
The Baltimore Water Company was incorporated on December 24, 1808. It continued to function until the fall of 1854 when the company was purchased by the City of Baltimore for the sum of \$1,350,000 and the Water Department was organized under a Water Board appointed by the Mayor.

Due to the growth of the city, the water system purchased from the Baltimore Water Company was inadequate for the water demands of the community. Between 1858 and 1862 the Water Department constructed the new Jones Falls supply consisting of a dam at Lake Roland, originally called Swann Lake, the necessary transmission mains and conduits, and Hampden and Mt. Royal reservoirs.

The Jones Falls supply was improved later by the construction of Druid Lake, Western Pumping Station, and Western High Service Reservoir, all in Druid Hill Park.

Many of the old wells and pumps had been abandoned and filled in by 1865 because of the failure of supply, contamination, etc. Resolutions were passed by the City Council and approved by the Mayor during the 1865 and 1866 sessions, authorizing the Water Board to install free flowing fountains at the markets and certain other locations near the docks.

In 1867 fifteen fountains were installed at the designated sites. That this source of water became increasingly important is shown by an inventory taken in 1915 which listed 263 fountains in service. The last ones were removed in 1945.



The Deer Creek Pumping Station in Harford County speeds the water flow to Baltimore from the Susquehanna River.

## FIRST PUMPING STATION

During a prolonged drought in the fall of 1869, when the city was threatened with a water famine, it became apparent that the Jones Falls supply would not suffice for the future. After due investigation it was decided that the Gunpowder Falls should be developed as a source of supply, and in 1873 a temporary pumping station was constructed. Water was pumped, when needed, during the years 1874 to 1881, inclusive, from Gunpowder Falls through a pipeline to Roland Run, a tributary of Jones Falls.

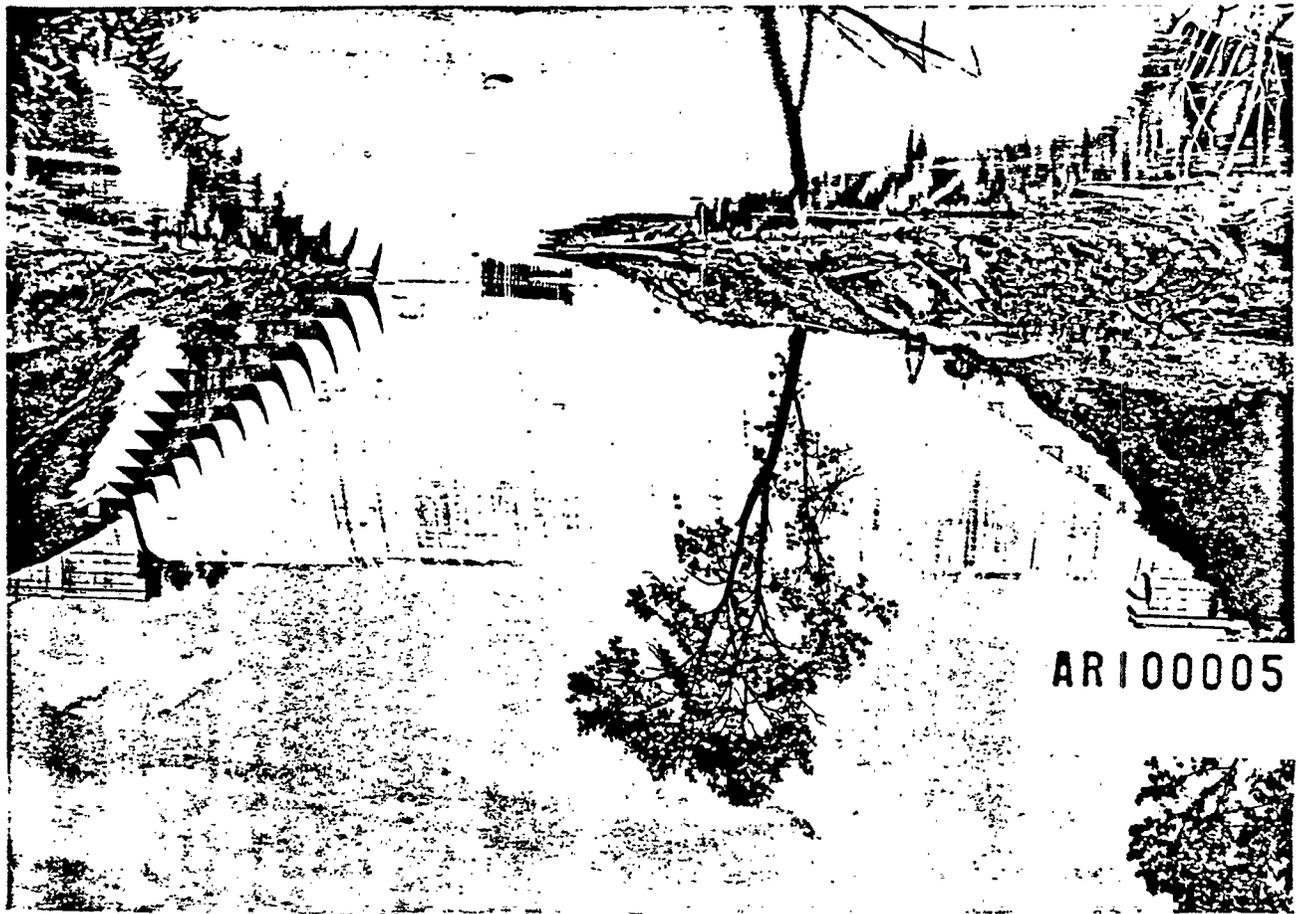
In the following year, 1875, construction of the permanent supply was begun, the entire program of improvements being completed in 1881. The system constructed at that time consisted of a stone dam across Gunpowder Falls, a large reservoir known as Lake Montebello, a tunnel connecting the two structures, and the necessary distribution mains and conduits. A few years later, this system was augmented by the construction of Eastern Pumping Station, Lake Clifton and Guilford Reservoir.

The city was supplied from Jones Falls and Gunpowder Falls, two sources, from 1881 until 1915. From time to time during this period, various structures were added to the water system, notably Mt. Royal Pumping Station, Lake Ashburton, Arlington Standpipe, and Roland Standpipe.

In 1912, as a result of a study completed two years before, the city began work on the Gunpowder supply improvements. These consisted of a new dam on the Gunpowder Falls about 2500 feet upstream from the original dam, a purification plant, and conduits. The new dam, with a crest elevation of 188 feet above mean low tide, was built of such size and strength that it could be increased to a height of 240 feet above mean low tide at a later date when conditions might demand such change.

The Montebello Filtration Plant was constructed on the east side of Hillen Road, north of 33rd Street. All of these improvements were completed and placed in service in 1915, at which time the use of the Jones Falls supply was discontinued.

ART00004



Liberty Dam located on the North Branch of the Patapsco River sends raw water by gravity to the Ashburton Filtration Plant.

AR 100005

## TERRITORY ANNEXED

Through the annexation in 1918 of nearly 50 square miles of the territory surrounding Baltimore City and the purchase of many private water companies which operated in the annexed area and beyond, the need for water increased rapidly. The crest of the Loch Raven Dam was raised to elevation 240.

A second filtration plant was constructed at Montebello and, following completion of the new plant in 1928, the pumping system was improved. Eastern Pumping Station, which raised water into Guilford Reservoir, was replaced by Hillen Pumping Station; Mt. Royal Pumping Station was replaced by Vernon Pumping for raising water to Lake Ashburton; the Guilford and Ashburton pumping stations were built; and three small pumping stations supplying outlying sections of the distribution system were enlarged and modernized. The Prettyboy Dam and Reservoir were built on the Gunpowder Falls. All of these structures were in service by 1936.

The industrial activity due to World War II was reflected in the demand for water and plans were made to build a dam and reservoir on the North branch of the Patapsco River near Falls Run. A tunnel connecting the reservoir with the Montebello Filtration Plants, the dam and other structures needed before the river would be impounded were completed during 1954.

In September 1953, construction of a new filtration plant in the vicinity of Lake Ashburton was started. The Ashburton Filtration Plant was activated on June 5, 1956.

## GROWTH ANTICIPATED

Heretofore, the water works for Baltimore City and adjacent areas were developed in part in answer to requirements brought about through increases in population and business activity in the area sup-

plied. In January 1952 with considerable work on the Patapsco River Project planned or completed, the city decided to anticipate the growth of its water demands, and a Board of Advisory Engineers was appointed to determine population and water consumption for the area probably to be supplied in the year 2000.

The Board reported on December 15, 1953 and recommended the development of a pumped water supply from the Susquehanna River at Conowingo with an ultimate capacity of 230 million gallons per day. Engineering studies for this project were started in 1955 and construction was initiated in 1958.

Construction of two pumping stations, an intake on the river and connecting tunnels and pipelines between the Susquehanna River and the Montebello Filtration Plants continued until January, 1966. The system of supply was activated on January 17, 1966.

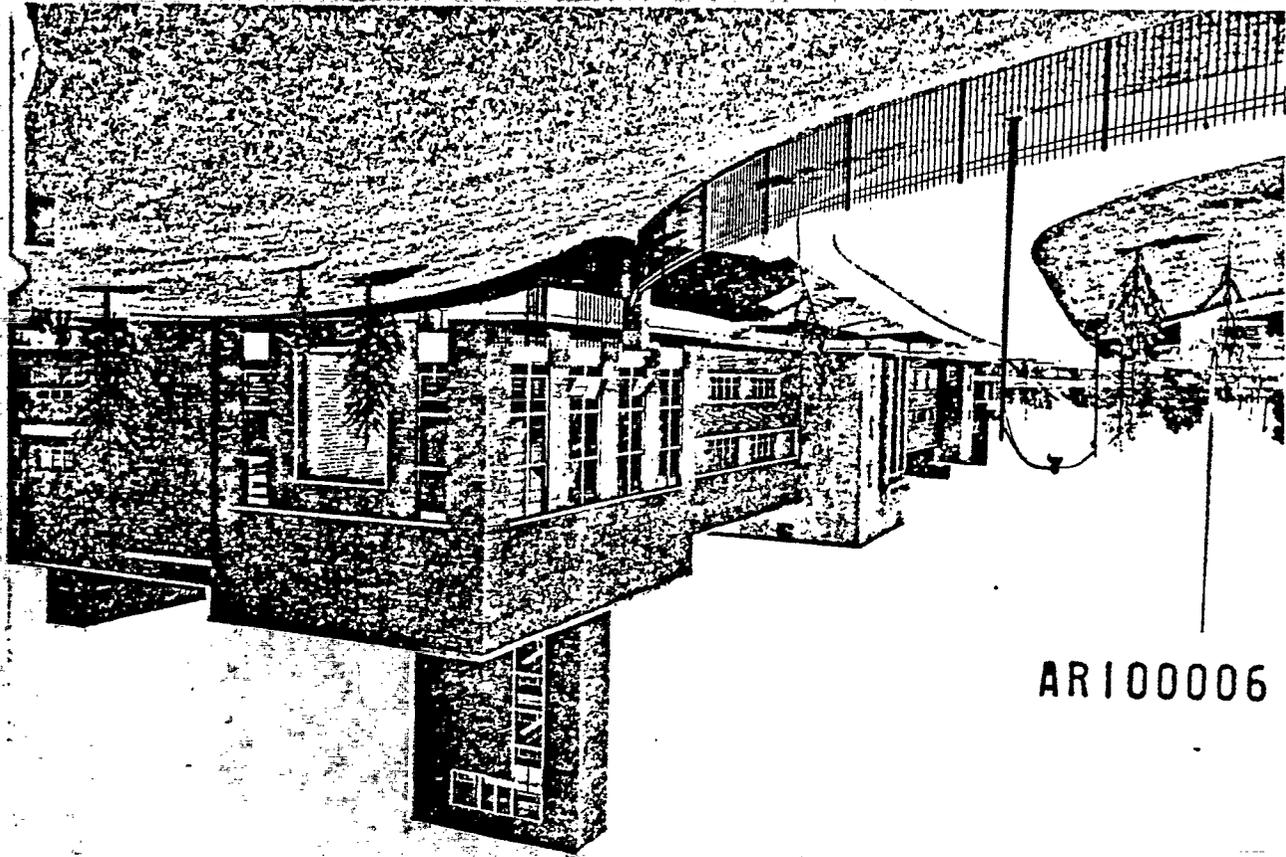
## WATER ENGINEER APPOINTED

In 1925, through an ordinance approved on July 17, the City of Baltimore brought under one head the engineering, construction and maintenance departments of the municipal government, eliminated various boards and commissions under which some of the departments operated, and consolidated the departments having like functions.

By this action the administration of the municipally owned water supply system was shifted from the Water Board, its regulatory powers passing to the Board of Estimates, the chief executive board of the city.

The Water Department was renamed the Bureau of Water Supply and the title of its executive officer remained the same, Water Engineer; but he became responsible to the Director of Public Works for the functions of the bureau. The Water Engineer remained an appointee of the Mayor, subject to City Council approval.

The Ashburton Filtration Plant at Liberty Road and Druid Park Drive was activated on June 5, 1956. A 10-foot tunnel feeds water from Liberty Dam.



AR100006

## DEPARTMENT REORGANIZED

Under the reorganization of the Department of Public Works which became effective on March 15, 1968, the Bureau of Water Supply became non-existent and its various functions assigned to three new bureaus. They are the Bureau of Engineering, C. Edward Walter, Bureau Head; the Bureau of Utility Operations, Gene Neff, Bureau Head; and the Bureau of Consumer Services, Clifford W. Mackay, Bureau Head.

The Water Division of the Bureau of Engineering studies all proposed improvements, prepares plans for various new additions to the water system and establishes water rates.

The Purification Section of this division filters and purifies all raw water before it is allowed to enter the distribution system.

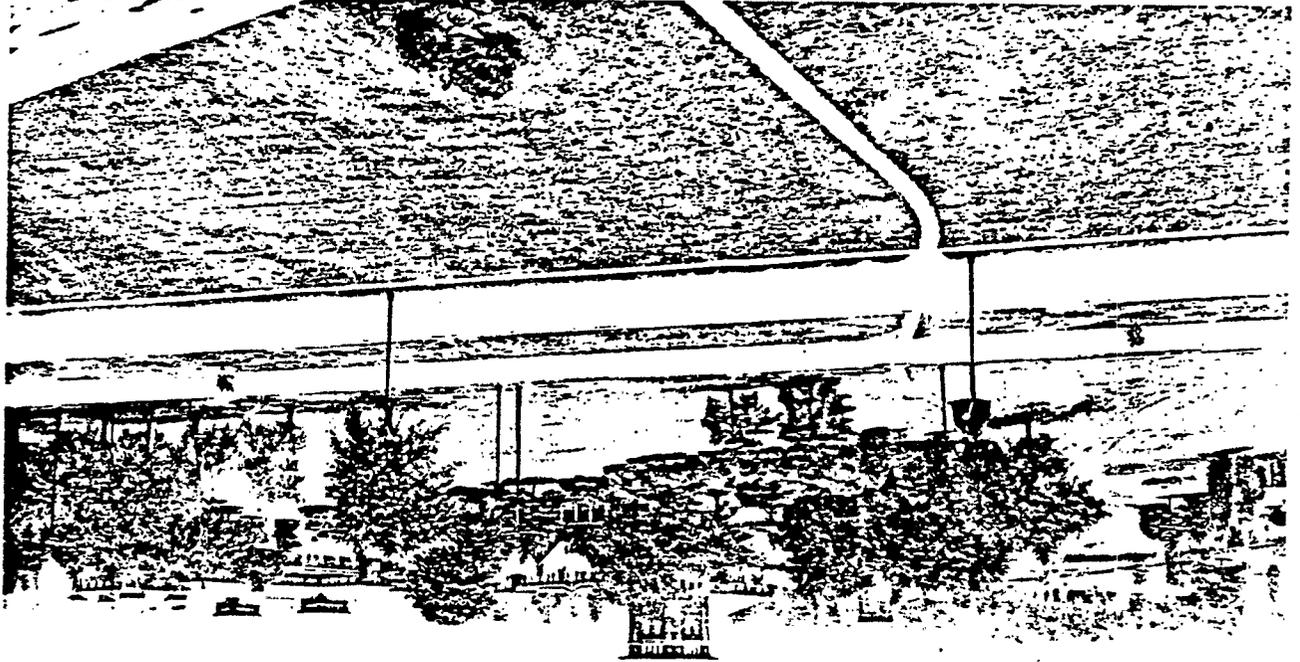
The Pumping Section operates and maintains the pumping stations in the distribution system. The Watershed Section manages a program which includes sanitation control and soil erosion prevention. A program of forest land use is designed to assure continuance of the productive and hydrologic functions of the land. It also maintains roads within the Loch Raven, Prettyboy and Patapsco watersheds.

The Conservation Section detects and locates sources of water waste and is responsible for water use statistics and the maintenance of record instruments associated with this data.

The Utilities Maintenance Division of the Bureau of Utility Operations handles all small construction, such as the installation of auxiliary water mains. The Maintenance Section of this division locates and repairs leaking pipe joints, broken water mains and water supply services. It also services defective water meters.

The Construction Section is responsible for installation of consumer water meters, handles all new small main installations and maintains the entire distribution system which includes all water mains, fire hydrants, secondary reservoirs and tanks.

The Customer Accounts Division of the Bureau of Consumer Services accepts applications for various water services. It is responsible for reading water meters and preparing bills for water and waste water service accounts.



The Montebello Filtration Plant on the east side of Hillen Road north of 33rd St. was activated in 1915. A second plant was put in service in 1928.

AR100007

## WHERE WE GET WATER

The water supplied by the Department of Public Works to residents of Baltimore City and adjacent territory is obtained from three sources: the Gunpowder Falls, the North Branch of the Patapsco River, and the Susquehanna River. They are classified as surface supplies.

### Gunpowder Falls and Patapsco River

The Gunpowder Falls development has a watershed above Loch Raven Dam of 303 square miles. Two dams located on this stream, one at Loch Raven and the other farther upstream near the mouth of Prettyboy Creek, impound water and store it in the reservoirs formed by them. These reservoirs have a combined capacity of 43 billion gallons, most of which can be delivered by gravity to the Montebello Filtration plants through a 12-foot diameter tunnel.

The development on the Patapsco River with a watershed of 164 square miles, consists of the Liberty Dam located near Falls Run on the North Branch of the river, and the Liberty Reservoir with a capacity equal to that of the two reservoirs on the Gunpowder Falls, namely 43 billion gallons. Most of this water can be delivered by gravity to the Ashburton Filtration Plant through a 10-ft. tunnel.

### Prettyboy Dam and Reservoir

Prettyboy Dam is a concrete gravity dam located on the Gunpowder Falls, about three miles southwest of Parkton. The crest of the dam is 520 feet above sea level. A reinforced concrete arch bridge, with a roadway 20 feet wide and a footway on each side, crosses this dam.

Other data is as follows:

Spillway length	274 feet
Total length	845 feet
Height of crest above stream bed	130 feet
Capacity of reservoir	20,000,000,000 gal.
Flooded area at crest elevation	1,500 acres
Length of shore line at crest elevation	46 miles
Area of land owned	7,380 acres
Water overflowed crest for first time	Sept. 23, 1933

### Loch Raven Dam and Reservoir

Loch Daven Dam is a concrete gravity dam, located on the main stream of the Gunpowder Falls below the mouths of all the large tributaries. The dam was raised to its present elevation, 240 feet above sea level, in 1923, by adding 52 feet to the structure erected in 1914.

Other data is as follows:

Spillway length	288 feet
Total length	650 feet
Height of crest above stream bed	82 feet
Capacity of reservoir	23,000,000,000 gal.
Length of shore line at crest elevation	50 miles
Area of land owned	8,000 acres
Flooded area at crest elevation	2,400 acres
Water overflowed present crest for first time	May, 1923

### Liberty Dam and Reservoir

Liberty Dam also is a concrete gravity dam. It is located on the North Branch of the Patapsco River at a site approximately two miles south of Liberty Road. The crest of the dam is at an elevation of 420 feet above sea level.

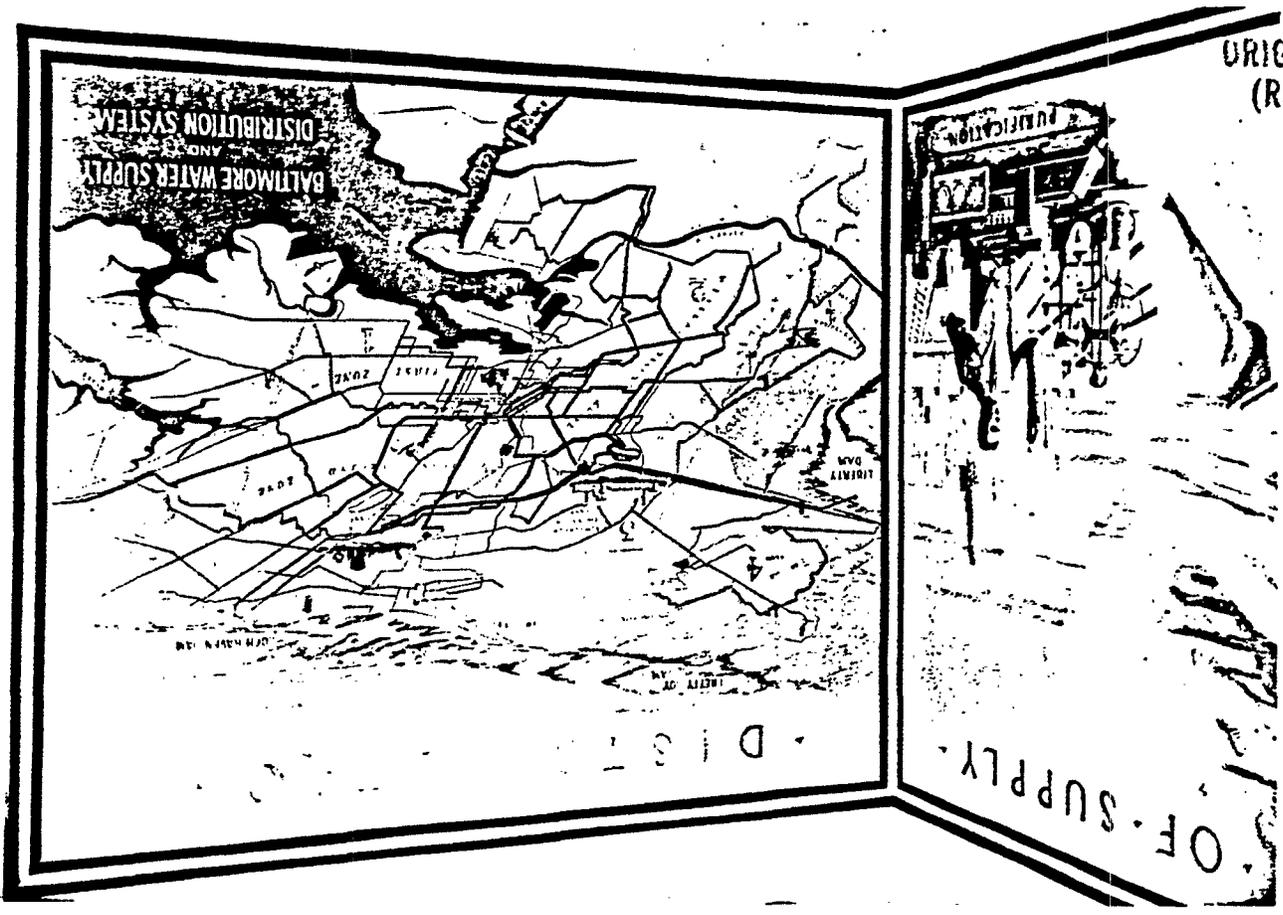
Other data is as follows:

Spillway length	480 feet
Total length	704 feet
Height of crest above stream bed	160 feet
Capacity of reservoir	43,000,000,000 gal.
Flooded area at crest elevation	3,100 acres
Length of shore line at crest elevation	82 miles
Area of land owned	9,200 acres
Water overflowed crest for first time	Feb. 6, 1956

## HOW WATER IS IMPOUNDED

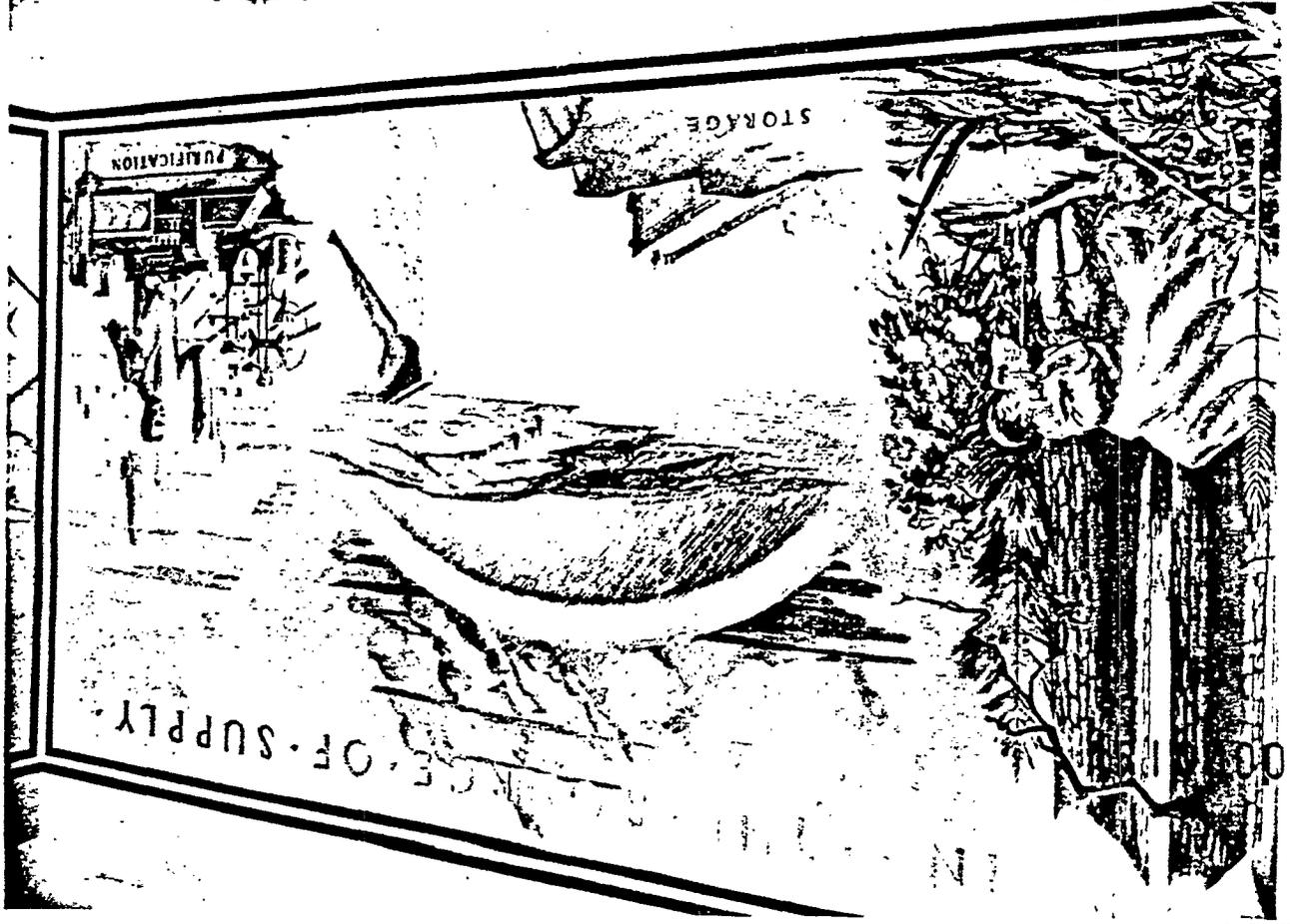
Under normal operating conditions, water flows by gravity from the Loch Raven Reservoir to the Montebello Filtration Plants through the Gunpowder Falls-Montebello Tunnel, a concrete lined tunnel, 12 feet in diameter, and approximately seven miles in length. This tunnel was constructed through solid rock.

When the water level in Loch Raven Reservoir is lowered a few feet below the crest of the dam, the discharge valves at Prettyboy Dam are opened. The water released flows down the bed of the Gunpowder Falls into Loch Raven Reservoir, thus maintaining the water level in the latter reservoir at a predetermined elevation.



ORIGINAL  
(Red)

This montage mural covers two walls in the lobby of the Ashburton Filtration Plant. It tells the story of the Baltimore Water Supply and Distribution System from the source, storage, purification and distribution.



AR100009

Water can be pumped from the Loch Raven Reservoir to the Montebello Filtration Plants by a pumping station located at the plants. The station, called the Montebello Raw Water Distribution Center, was constructed in 1958 in connection with the Susquehanna Water Supply Project. The station contains three pumps, each having a capacity of 120 million gallons per day, and appurtenant equipment.

Water from Liberty Reservoir flows through a concrete-lined tunnel, 10 feet in diameter, to the Ashburton Filtration Plant, a distance of approximately 12½ miles. This tunnel was constructed through solid rock.

At some future time, when pumps are placed in the Ashburton Filtration Plant, it will be possible to pump water from Liberty Reservoir whenever the water level falls too low for gravity flow.

#### The Susquehanna River Supply

The Susquehanna Water Supply Project includes:

1. The Conowingo Intake with an initial capacity of 250 million gallons per day. This structure has an ultimate design capacity of 500 million gallons per day.
2. The Deer Creek Pumping Station, where three 50 million gallons per day capacity pumps were initially installed and provision was made for the future installation of two pumps of the same capacity. The ultimate design capacity of the station is 243 million gallons per day.
3. The connecting tunnels and pipelines, a transmission system 202,096 feet or 38.27 miles long, were constructed as:
  - 2,370 feet of 144-inch tunnel
  - 12,100 feet of 108-inch tunnel
  - 150,136 feet of 108-inch pipe
  - 37,490 feet of 96-inch pipe

## HOW WATER IS MADE FIT TO DRINK

In order to produce water that will meet accepted standards for public drinking water, it may be necessary to use any or all of the following treatments: chlorination, chemical treatment, coagulation, sedimentation, filtration and flouridation.

Accepted standards require the finished water to be free of all organisms of a pathogenic nature. In addition, there are limitations to the concentration in the finished water of chemical constituents which are considered harmful or otherwise undesirable. To meet these requirements, it is necessary not only to sterilize, but in some localities where the raw water has a high mineral content, to demineralize, or to soften the water as well.

In Baltimore, as in other sections of the country where the mineral content of the raw water is low, the basic treatment procedure is as outlined below for the two Montebello plants and the Ashburton plant.

#### Chlorination

Chlorine is used as a sterilizing agent and is applied to the water immediately after it passed through a meter which measures and records the rate of flow. By adding the chlorine at this point it is possible to keep the water in a sterile condition throughout the entire procedure. Enough chlorine is added to maintain between 0.5 and 0.7 part per million residual chlorine in the water after it has passed through the filters.

Parts per million expresses a relationship in weight, i.e., one pound of chlorine added to one million pounds of water is a dosage of one part per million. If for any reason the residual should drop below 0.5 part per million, more chlorine is added after filtration.

AR100010

### Coagulation and Sedimentation

Alum is used as a coagulating agent to collect the mud and suspended material in the raw water. After this coagulant is added to the water at rates varying from 0.5 to 1.5 grains per gallon, the water enters a basin where the alum is thoroughly mixed with the water. The alum reacts with the alkalinity in the water and forms aluminum hydroxide, which will precipitate as a "floc" (a sticky, gelatinous solid). The floc resembles small sponges.

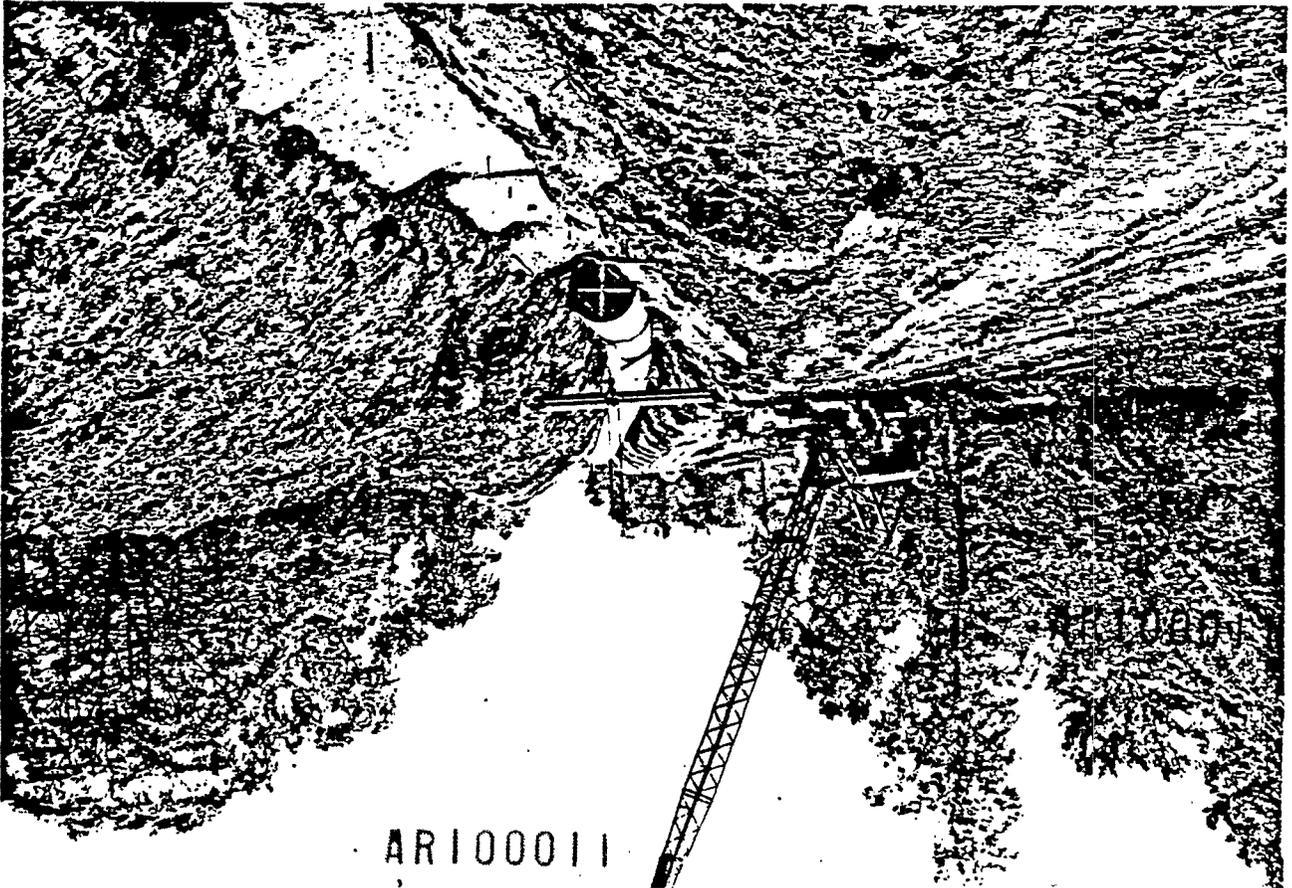
The formation of a proper floc is of the highest importance in the purification process since without it, neither the settling nor the filtering process would be done properly. At both the Montebello and the Ashburton Filtration plants, mechanical means are used to assure a good floc, the water being agitated by slow-moving flocculators.

After mixing, the water moves into the settling basins. These are large rectangular tanks through which the water flows at a very slow rate. The basins are designed so that sufficient time elapses in the passage of water for the particles of floc with their absorbed materials to settle to the bottom. The settled material is removed by hand at Montebello; this operation is mechanical and continuous at Ashburton.

### Filtration

The last step in clarifying the water is accomplished by passing it through about 20 inches of sand. As the water filters through the sand, the remaining particles of suspended matter in the water adheres to the grains of sand.

The sand is supported upon a well-graded bed of gravel, the top layer of which is only a little coarser than the sand. After passing through the filters, the sparkling clear water enters the filtered water reservoirs, and when it leaves, it flows into the water mains which form the distribution system.



The 108-inch pipe passing under Carstairs Run shown as it was being constructed as part of the Susquehanna Water Supply Project in 1964.

AR100011

In filtering, the water is admitted above the sand, passes downward through the sand and gravel, through controllers which regulate the rate of filtration, and then into the filtered water reservoirs. In washing the filters, the direction of flow is reversed and a large volume of water is passed upward through the gravel and sand.

The sand bed is lifted by the water and the silt is loosened and carried off through gutters. Filters are washed at intervals of about two days under average conditions of turbidity.

#### **Purification Plants**

Montebello filters comprise two complete plants. The first, located on the east side of the 3900 block Hillen Road, was put into operation in 1915, and has 32 filter units and a capacity of 128 million gallons per day.

The second plant is located on the west side of Hillen Road, directly opposite the first plant, with 28 units and a capacity of 112 million gallons per day. This plant was placed in service in 1928. The Ashburton plant was put into service in 1956, and is located at 3001 Druid Park Drive. This plant has a capacity of 120 million gallons per day with 20 filter units.

#### **Fluoridation**

Fluoridation of the water supply was begun on November 26, 1952. Hydrofluosilicic acid is added to the water in sufficient quantities to maintain a concentration of 1.00 part per million. This chemical is added to inhibit tooth decay.

AR100012

#### **Lime**

The application of alum to the raw water for coagulation increases the acidity and hence, the corrosiveness of the water. In order to counteract this, lime is added to the filtered water in the amount of approximately 1/2 grain per gallon.

#### **Additional Treatment**

Activated carbon may be added for removal of tastes and odors from the raw water, when necessary.

Copper sulfate is added to destroy algae in the reservoirs, when necessary.

Soda ash is introduced into the water at distribution reservoirs when control of the acidity of the water is indicated.

#### **Chlorinator Stations**

Water in storage in open reservoirs is subject to contamination. Automatic chlorinator stations are provided at each of our distribution reservoirs to re-chlorinate the water entering these reservoirs in order to keep it as sterile as possible, and also prevent the growth of algae. In addition to this, chlorine is also applied to the water leaving these reservoirs to keep it pure throughout the distribution system. These chlorinator stations function automatically, dependent on the flow into or out of the reservoir, and are inspected and serviced once each day.

#### **Laboratory Control**

Careful supervision is exercised in every step of the treatment process, samples of water being taken at various points through the filtration plants every two hours, day and night. Bacteriological tests are made regularly of samples collected from widely separated points of the distribution system from all the distribution reservoirs and from different points in the impounding reservoirs.

ORIGINAL  
(Red)

## HOW WATER IS DELIVERED TO YOUR HOME

The distribution system which serves an area of approximately 214 square miles, consists of a network of mains varying in size from three inches to nine feet in diameter. The majority of these mains are of cast iron, but some of the larger sizes, that is, 16 inches and larger in diameter, are of steel or reinforced concrete. More than 2,700 miles of mains were in service in the distribution system at the end of 1965.

These mains connect a series of pumping stations, reservoirs and elevated storage tanks, which supply water to Baltimore City and parts of three adjacent counties: Baltimore, Howard, and Anne Arundel. Within this network of mains, five zones of service are maintained to supply adequate water pressure to the consumers. Each zone is designed to meet the limiting ground elevations in a particular area of the distribution system.

Under the present operating system, the Montebello Filtration plants supply water to the First Zone by gravity, and to the Second and Third zones by pumping. The Ashburton Filtration plant supplies water to the Second Zone by gravity, and to the Third, Fourth and Fifth zones by pumping.

The First and Second zones contain about half of the land in the distribution system but consume about 75% of the filtered water supply. Most of the heavy industry within the Baltimore Metropolitan region is located in the First Zone.

The Second Zone supplies water to considerable commercial and light industrial developments. Both the First and Second zones, however, supply water to large residential developments within their limits.

The Third, Fourth and Fifth zones contain the remaining half of the land in the distribution system, but consume about 25% of the filtered water supply. The consumers in these zones are predominantly residential in nature with some mercantile interests.

The data and statistics used in the following zone analysis pertain to the year 1965, when the system supplied an average of 224,000,000 gallons of water per day to 1,444,000 consumers, an average of 155 gallons per person per day.



Another view during construction of the 38.27 miles 108-inch pipe of the Susquehanna Water Supply Project. The structure has an ultimate design capacity of 500 million gallons per day.

### First Zone

The First Zone of service supplies water to about 70 miles of land on the southeastern part of Baltimore City and adjacent parts of Baltimore County and Anne Arundel County. Druid Lake, the Curtis Bay Tank, and the Montebello filtered water reservoirs provide more than 300 million gallons of storage capacity in this zone.

About 103 million gallons per day is consumed in the First Zone. Ground elevations vary from sea level to 100 feet above sea level, and the water level in the filtered water reservoirs is 212 feet.

### Second Zone

The Second Zone of service supplies water to about 34 square miles of land in the central part of Baltimore City and parts of Baltimore County and Anne Arundel County. Guilford Reservoirs and Lake Ashburton provide more than 250 million gallons of storage capacity in this zone and suction for the Third Zone pumping stations. About 56 million gallons a day is consumed in the Second Zone.

Ground elevations vary from 100 to 240 feet, and the high water levels in Guilford Reservoir and Lake Ashburton are 341 feet and 353 feet respectively.

The Colgate Second Zone of service supplies water to about 0.7 square miles of land in Baltimore County within the area served by the First Zone of service. The Colgate Pumping Station takes suction from the First Zone and pumps into the 0.3 million gallon Colgate elevated storage tank. This system supplies more than 0.6 million gallons a day to the predominantly residential consumers. Ground elevations vary from 90 feet to 160 feet, and the overflow elevation of the Colgate tank is 258 feet.

### Third Zone

The Third Zone of service is divided into two service areas, the eastern and western. The eastern area supplies water to about 31.5 square miles of land in the northeastern part of Baltimore City and adjacent parts of Baltimore County.

The principal supply for this service area originates at the Guilford Pumping Station, which takes suction from the Guilford Reservoir and discharges into the 16-million Towson Reservoir, which in turn provides storage for the eastern area and suction for the Towson Fourth Zone pumping station.

Recently, the supply for this service area was augmented by the new Cromwell Pumping Station, which is located over the old unlined Loch Raven water tunnel near Cromwell Bridge Road in Baltimore County and about 4½ miles north of the Montebello Filtration plants.

This tunnel had been put into service in 1881 for the conveyance of Gunpowder Falls water from the old Loch Raven Dam to Lake Montebello, but had been placed in reserve in 1940 when the new Gunpowder Falls-Montebello lined tunnel was put into service. For the operation of the Cromwell Pumping Station, the old tunnel was closed north of the station.

Filtered water is sent through the tunnel from Montebello by gravity. The pumping station takes suction from a shaft to the tunnel, gives secondary treatment to the water as may be required, and discharges the water into Towson Reservoir and into the northeastern part of the service zone.

Its present capacity is 12 million gallons a day. About 19 million gallons a day is consumed in this service area. Ground elevations vary from 240 feet to 380 feet, and the high water level in the Towson Reservoir is 515 feet.

The Western Third Zone supplies water to about 39 square miles of land in the northwestern part of Baltimore City and adjacent parts of Baltimore County and Howard County.

The supply for this service area originates at the Ashburton Pumping Station which takes suction from Lake Ashburton and discharges into the 21 million gallon Pikesville Reservoir and the four million gallon Melvin Avenue tank. These reservoirs provide storage for the Western Third Zone and suction for the Fourth Zone pumping station.

About 23 million gallons a day is consumed in this service area. Ground elevations vary from 240 feet to 480 feet, and the high water level in the Pikesville Reservoir and Melvin Avenue Tank is 567 feet.

### Fourth Zone

The Fourth Zone of service is divided into three service areas, namely, Towson, Pikesville and Catonsville. The Towson Fourth Zone supplies water to about 18.5 square miles of land in the vicinity of Towson and Cokesville in Baltimore County.

The supply for this service originates at the Towson Pumping Station, which takes suction from the Towson Reservoir, and discharges into the Ware Avenue and the Stratford elevated storage tanks and the Mays Chapel Reservoir. Total storage capacity in the zone is 7.3 million gallons. About eight million gallons a day is consumed in the Towson Fourth Zone. Ground elevations vary from 360 feet to 480 feet, and the overflow elevation of the tanks is 600 feet.

The Pikesville Fourth Zone supplies water to about ten square miles of land in the vicinity of Randallstown, Pikesville and Pleasant Hill in Baltimore County. The supply for this service originates at the Pikesville Pumping Station, which takes suction from the Pikesville Reservoir, and discharges into the Randallstown, Pleasant Hill and Deer Park elevated storage tanks.

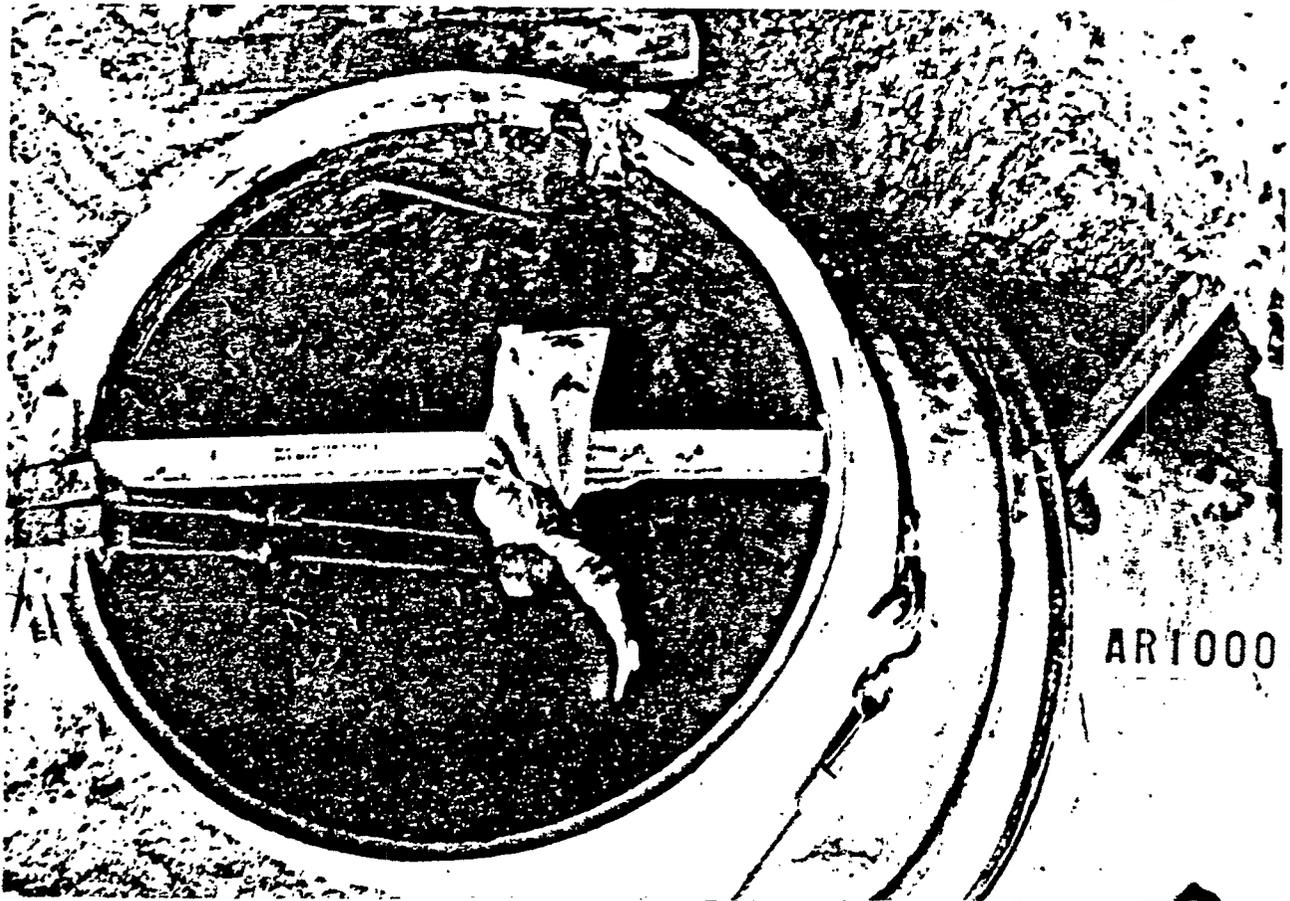
These tanks have a total capacity of 2.6 million gallons. About four million gallons a day is consumed in this service area. Ground elevations vary from 460 feet to 600 feet, and the overflow elevation of the tanks is 740 feet.

The Catonsville Fourth Zone supplies water to about six square miles of land in the vicinity of Catonsville, Baltimore County. The supply for this service area originates at the Catonsville Pumping Station, which takes suction from the Third Zone Distribution System, and discharges into the one million gallon Dorchester elevated storage tank. About three million gallons a day is consumed in this service area. Ground elevations vary from 400 feet to 500 feet, and the overflow elevation of the tank is 630 feet.

**Fifth Zone**

The Fifth Zone of service is divided into two service areas: Reisterstown and Pot Spring. The Reisterstown Fifth Zone of service supplies water to about 2.5 square miles of land in the vicinity of Pleasant Hill and Reisterstown in Baltimore County. The supply for this service zone originates at the Pleasant Hill Pumping Station, which takes suction from the Pleasant Hill tanks, and discharges into the 0.3 million gallon Reisterstown elevated storage tank. About 0.6 million gallons a day is consumed in this service area. Ground elevations vary from 600 feet to 720 feet, and the overflow elevation of the tank is 850 feet.

The Pot Spring Fifth Zone supplies water to a small area in the vicinity of Timonium in Baltimore County. The supply for this service originates at the Stratford Pumping Station, which takes suction from the Towson Fourth Zone at the Stratford Tank and discharges into the Spring Lake elevated storage tank. This 0.4 million tank has an overflow elevation of 650 feet. About 0.5 million gallons a day is consumed in this service area. Ground elevations vary from 480 feet to 540 feet.



Foreman directs setting of bend in 108-inch pipe during 1964 construction of the Susquehanna River Water Supply Project. The Conowingo Dam intake has an initial capacity of 250 million gallons a day.

ART00015

## HOW WATER PRESSURE IS MAINTAINED

There are eleven pumping stations in active use, with a total capacity of approximately 255 million gallons a day, although the average daily pumpage is about 109 million gallons a day. Guilford and Ashburton pumping stations are continuously attended by Water Division personnel; the other nine stations are operated by remote control, or they operate automatically.

When controlled by automatic operation, the stations are activated by the rise and fall of the water level in the elevated tank or reservoir. As the water level falls, the telemetered control starts a pump and adds more pumps if the level continues to fall. As the water level rises, the telemetered control shuts off the pumps in sequence until the station is completely shut down.

When the stations are to be operated by remote control, the same telemetering system transmits manual commands originating in a monitoring station. Through the telemetering system, the pumpage, the pressure and the elevation of the water level in the reservoirs or tank are transmitted to the monitoring station located at either Ashburton or Guilford pumping stations.

Approximately 600 million gallons of water is stored in filtered water reservoirs, open ground reservoirs and elevated storage tanks. More than 500 million gallons is concentrated in the First and Second zones where the storage reservoirs are filled by gravity from the filtration plants.

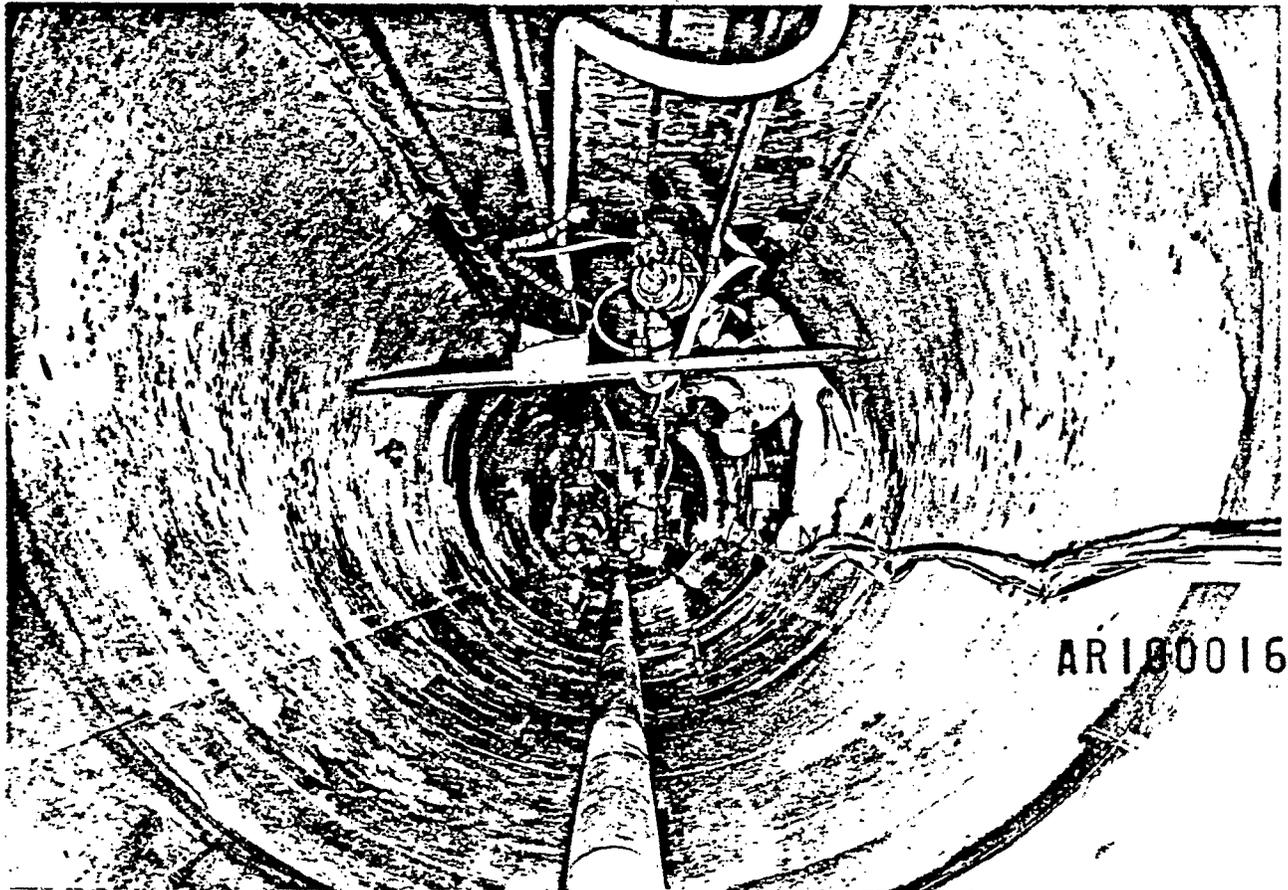
During periods when the demand for water exceeds the filter rate, the storage reservoirs feed into the system to augment the flow from the filtered water reservoirs. When the filter rate exceeds the demand, the storage reservoirs refill.

## HOW CONSUMERS ARE CHARGED FOR WATER SERVICE

Water furnished to the consumers is sold on both the metered and unmetered basis. In general, the residential properties in the central part of the city are unmetered, while dwellings in the outlying districts of the city and those in the adjacent counties are metered.

The Bureau of Utility Operations converts more than 5000 of the unmetered services to metered services every year, and this practice will continue until all such properties are metered. Water used for fire fighting and for public purposes is furnished free of charge.

An unmetered rate is based on the width of the property. A mini-



Workmen seal section points of 108-inch pipe of the Susquehanna River Water Supply Project. The men are dwarfed by the immense size of the facility.

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ORIGINAL  
(Red)

imum quarterly charge is assessed for a metered service, depending on the size of the meter, with an allowance of water to cover this minimum charge. Any additional water above the allowed consumption is charged at the regular scheduled rates. Consumers in Baltimore County also pay a fixed service charge based on the size of the meter.

Water consumers in Howard County are supplied through two master meters. One of those is located in the vicinity of Elkridge; the other in the vicinity of Ellicott City. In Anne Arundel County, consumers located in the Third Election District and parts of the Fifth Election District are supplied by individual water supply services, while other areas in the county are supplied through master meters.

### LOOKING AHEAD TO THE YEAR 2000

The Baltimore Water Service Area in the year 2000 will probably contain a land area of 700 square miles, more or less. The planning, which resulted in the construction of the Susquehanna River Project, used this area as a basis for estimates of future water demands. The area, as defined in the 1953 report of the Board of Advisory Engineers on Future Water Supply is bounded as follows:

- (a) On the South: From Chesapeake Bay at the mouth of the Magothy River, through Jessup, Waterloo and Columbia, to the forks of the Patapsco River.
- (b) On the West: Northward from the forks of the Patapsco River along the boundary of Carroll and Baltimore counties, to the northern corner of Election District No. 4 of Baltimore County.
- (c) On the North: Along the northern limits of Election Districts Nos. 4, 8 and 10 of Baltimore County.
- (d) On the East: From the northeast corner of Election District 10, along the Baltimore-Harford county line to Maryland Route 152, along Route 152 to U. S. Route 40, then to the Gunpowder River and the Chesapeake Bay.

The water distribution system must be enlarged as development of open land in the defined area takes place. New filtration, pumping and storage facilities must be constructed, and new large diameter water mains must be installed. Planning for these water works is a complex and slow procedure.

Through the use of the network analyzer, studies have been made to determine the size of the water distribution system required to meet the demands in the Baltimore Water Service Area as they will probably occur in the year 2010.